CLAIMS

Having thus described the invention, we claim:

1. Fluid dispensing apparatus for applying a liquid material to a substrate, comprising:

at least two liquid dispensing nozzles each disposed within a respective nozzle block;

a web of material that is porous for liquid material dispensed from each said nozzle; said porous material being disposed between each said nozzle block and the substrate;

each said nozzle being operable to dispense liquid material onto the substrate by contact between said porous material and the substrate.

2. The apparatus of claim 1 wherein each said nozzle block can pivot about a first axis.

3. The apparatus of claim 1 wherein each said nozzle block comprises a surface that supports said porous material against the substrate with pressure being applied to said porous material when said porous material is in contact with the substrate during a dispensing operation.

4. The apparatus of claim 3 wherein each said block is compliant with variations in the substrate by pivoting movement with respect to at least one axis.

5. The apparatus of claim 4 wherein each said block is restricted against pivoting movement with respect to two axes that are each orthogonal to said at least one axis.

6. The apparatus of claim 3 comprising a channel formed in said surface and that is in fluid communication with a respective nozzle so that when liquid material is dispensed from said nozzle liquid material collects in said channel and is absorbed through said porous material onto the substrate.

7. The apparatus of claim 6 wherein liquid material is dispensed through said porous material under pressure.

8. The apparatus of claim 1 wherein each nozzle block can be individually positioned against the substrate to dispense liquid material thereon through said porous material.

9. The apparatus of claim 8 wherein said dispensing nozzles are mounted on a frame, and comprising a device for moving said frame to present each said nozzle and associated nozzle block against the substrate for dispensing liquid material thereon.

10. The apparatus of claim 9 wherein said device comprises a robotic arm and the substrate comprises a glass plate.

11. The apparatus of claim 10 wherein said glass plate comprises a motor vehicle windshield.

12. The apparatus of claim 8 wherein said device imparts relative motion between said nozzles and the substrate.

13. The apparatus of claim 1 wherein said porous material comprises a web of felt.

14. The apparatus of claim 1 comprising a flow regulator for controlling quantity of liquid material dispensed from said nozzles.

15. The apparatus of claim 1 comprising a supply mechanism for providing an unused portion of said porous material to each said nozzle block prior to a dispensing operation.

16. The apparatus of claim 15 wherein said supply mechanism comprises a continuous web of said porous material fed from a supply reel and received by a take-up reel.

17. The apparatus of claim 16 wherein each said nozzle dispenses liquid material onto the substrate prior to said supply mechanism feeding an unused portion of said porous material to each said nozzle block.

18. The apparatus of claim 2 wherein each said nozzle comprises a ball member that is received within said respective nozzle block.

19. The apparatus of claim 18 wherein each said nozzle block comprises a resilient member that slides over said ball when said ball is installed in said block to retain said block on said ball.

20. The apparatus of claim 19 wherein said resilient member comprises an -o-ring and seals against back flow of the liquid material.

21. Fluid dispensing apparatus for applying a liquid material to a substrate, comprising:

at least one liquid dispensing nozzle disposed within a rub block;

a web of material disposed against said rub block and that is porous to liquid material dispensed from said nozzle;

said porous material being supported on said rub block;

said nozzle being operable to dispense liquid material onto a surface of the substrate by contact between said porous material and the substrate with liquid material flowing through said porous material to said substrate;

wherein said rub block can pivot about a first axis in response to variations in the substrate surface.

22. The apparatus of claim 21 wherein said rub block and nozzle form a ball and socket coupling.

23. The apparatus of claim 21 wherein said nozzle includes a spherical nozzle body and said rub block includes a partially spherical cavity that receives said nozzle body.

24. The apparatus of claim 23 wherein said rub block is retained on said nozzle body by an elastomeric seal.

25. The apparatus of claim 21 wherein said nozzle is mounted to a frame that is translated across the surface of the substrate by relative movement therebetween to apply a bead of liquid material to a perimeter portion of the substrate.

26. The apparatus of claim 21 wherein said rub block is restricted against pivoting about two other axes normal to said first axis.

27. A dispensing head for a liquid dispensing gun, comprising:

a nozzle having a main body with an outlet orifice formed therein; and

a rub block mountable on said nozzle main body for articulated movement therewith.

28. The assembly of claim 27 wherein said rub block and nozzle main body are coupled together as a ball and socket arrangement.

29. The assembly of claim 27 wherein said rub block comprises a surface that supports a porous material and has a recess in said surface adjacent said porous material; said recess being in fluid communication with said nozzle outlet orifice.

30. The assembly of claim 27 wherein said outlet orifice is open and closed by a needle valve.

31. The assembly of claim 27 wherein said rub block pivots about a first axis and is restricted against pivoting about second and third axes that are normal to said first axis.

32. Fluid dispensing apparatus for applying a liquid material to a substrate, comprising:

at least two liquid dispensing nozzles each disposed within a respective rub block;

a web of material that is porous for liquid material dispensed from each said nozzle; said porous material being disposed between each said rub block and the substrate;

each said nozzle being operable to dispense liquid material onto the substrate by contact between said porous material and the substrate;

each said rub block being selectively and separately positioned for contacting said porous material with the substrate.

33. The apparatus of claim 32 comprising a frame; said nozzles and associated rub blocks being disposed on said frame, and a mechanism for positioning said frame to first and second frame positions, wherein when said frame is in said first frame position a first of said rub blocks presses said porous material against the substrate and when said frame is in said second frame position a second of said rub blocks presses said porous material against the substrate.

34. A flow through liquid dispensing apparatus comprising:

at least one dispensing device having a nozzle for dispensing liquid material;

a porous material that can be positioned in contact with a surface during a dispensing operation wherein liquid material dispensed from said nozzle flows through said porous material to said surface; and

a flow pressure regulator for controlling flow volume of liquid material dispensed from said nozzle.

35. The apparatus of claim 34 comprising a flow meter for detecting out of tolerance flow rates.